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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application of

Applicants	:	Goebel et al.
Serial No.	:	10/669,479
Filed	:	September 24, 2003
Title	:	**FLOW FIELD PLATE ARRANGEMENT FOR A FUEL CELL**
Docket	:	GP-303584
Examiner	:	Robert W. Hodge
Art Unit	:	1746
Conf. No.	:	3973

CERTIFICATE OF MAILING
I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on August 18, 2006.

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MAIL STOP APPEAL BRIEF - PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

AMENDED BRIEF ON APPEAL

This is an amended brief filed in response to the Notice of Non-compliant Appeal Brief mailed July 21, 2006.

Real Party in Interest

The real party in interest in this application is General Motors Corporation, by an assignment from the named inventors recorded in the files of the U.S. Patent and Trademark Office on January 5, 2004 under Reel/Frame 014230/0465.

Related Appeals and Interferences

Applicants know of no currently pending related appeals or interferences that would have an effect on the outcome of this appeal.

Status of Claims

Claims 1-12 have been cancelled. Claims 13-42 are pending in this application and are before this Board for consideration on appeal. A copy of the appealed claims is found in the Appendix attached to this Brief.

Status of Amendments

A Request for Reconsideration was filed March 17, 2006. In an Advisory Action dated March 28, 2006 it was indicated that the request for reconsideration has been considered but does not place the application in condition for allowance because the Applicants arguments are not persuasive for reasons already made of record in the final office action dated January 19, 2006.

Accordingly, independent claims 13 and 42 and the claims which depend therefrom, i.e. claims 14-41 respectively, as finally rejected, are the claims on appeal before this Board. A correct copy of the appealed claims appears as an Appendix to the Brief.

Summary of Claimed Subject Matter

Applicants' invention is directed to a fuel cell comprising anode and cathode flow field plates having a multitude of flow channels separated by land features wherein the land features of the anode side are wider than the land features of the cathode side. In fuel cells, the flow field plate arrangement of the present invention provides higher power (lower cost per kW), improved durability, and less stringent assembly alignment. See Abstract.

In one embodiment, an electrochemical cell (400) comprises a membrane electrode assembly (406) defining an anode side (408') of the cell and a cathode side (408) of the cell. See FIG. 4, and paragraph [0033]-[0034]. The cell includes a first flow field plate (200) for the cathode side of the cell. The first flow field plate comprises a plurality of first channels (204) separated by first lands (412). See Fig. 4, and paragraph [0036]. The cell includes a second flow field plate (300) for the anode side of the cell. See FIG. 4, and paragraph [0033]-[0034]. The second flow field plate comprises a plurality of second channels (304) separated by second lands (410), wherein the membrane electrode assembly is interposed between the first and second flow field plates, and a pitch defined by the first flow field plate is less than a pitch defined by the second flow field plate. See Fig. 4, and paragraphs [0036]-[0038].

In another embodiment, the second channels (304) define a cross sectional width approximately equal to a cross sectional width defined by the first channels (204). See FIG. 4, and paragraph [0010]. The second flow field plate (300) defines a channel pitch substantially greater than a channel pitch defined by the first flow field plate (200). See Fig. 4, and paragraphs [0036]-[0038]. In still another embodiment, at least the second lands (610) are formed with a multiple of alternating angles relative to the first lands (620) in a plane parallel to the second flow field plate and the respective channel pitches and cross-sectional widths ensure at least 30% land-to-land contact which is insensitive to plate-to-plate positioning. See FIG. 6, and paragraphs [0039]-[0043].

Grounds of Rejection to be Reviewed on Appeal

The grounds of rejection for review on appeal are:

(1) Claims 13-22, 24, 28, 31, 33-42 are rejected under 35 U.S.C. §102(e) as being anticipated by Carlstrom (US 2003/0224239).

(2) Claims 23, 25-27, 29, 30 and 32 are rejected under 35 U.S.C. §103(a) as being unpatentable over Carlstrom in view of Suzuki (US 2002/0004158).

Grouping of Claims

The Examiner has stated two grounds of rejection, rejecting claims 13-22, 24, 28, 31, 33-42 under 35 U.S.C. §102(e) as being anticipated by Carlstrom (US 2003/0224239), and claims 23, 25-27, 29, 30 and 32 under 35 U.S.C. §103(a) as being unpatentable over Carlstrom in view of Suzuki (US 2002/0004158).

This application contains two independent claims, claims 13 and 42. Applicants will separately argue the patentability of those claims in the body of their argument section. The dependent claims will stand or fall with their independent base claim.

Argument

Rejection under 35 U.S.C. §102(e).

In the Office Action, claims 13-22, 24, 28, 31, and 33-42 are rejected as anticipated by U.S. Pre-Grant Publication No. 2003/0224239, hereafter "Carlstrom." This rejection is respectively traversed in view of the following comments.

Claim 13

Carlstrom fails to disclose each and every limitation of the claimed invention. Independent claim 13 recites, *inter alia*, the limitation of "a pitch defined by said first flow field plate is less than a pitch defined by said second flow field plate." Nowhere in Carlstrom is it disclosed or suggested that a pitch of a first flow field plate is less than the pitch defined by a second flow field plate. The "pitch" of a flow field plate is defined in the specification as "the cross sectional width of the channel plus the cross sectional width of an adjacent land." See paragraph [0005] of the specification in the present invention.

In paper No. 20060111, para. 1, lines 11-17, the Examiner alleges that the Applicants are changing their definition of the term "pitch." However, in both the arguments filed 8/16/05 and 12/19/05, the Examiner has been directed to sections of the specification for the definition the term "pitch." In the augment filed 8/16/05, Applicants were responding to the Examiner's incorrect definition of the term pitch presented in the Office Action dated July 6, 2005 (paper No. 20050621). At that time, Applicants believed that it was unnecessary to expound on the definition of the term "pitch" provided at page 9, paragraph [0029] as the cited prior art was clearly deficient in having a pitch (land width plus channel width) defined by a first flow field plate that is less than a pitch (land width plus channel width) defined by a second flow field plate. Applicants were apparently correct in this assertion as the Examiner drop the anticipatory rejections to Gurau et al., Suzuki et al., and Wilkinson et al. in the next Office Action dated October 7, 2005, and then provided the then newly cited reference to Carlstrom.

However, in view of the Examiner alleging in paper No. 20051003, para. 8, lines 3-7, that Carlstrom teaches that "the channels are designed to be varied in shape and pattern, where the channels can be different sizes, and cross sectional areas [*sic*] would therefore have varying land-to-land contact across the membrane with a pitch of one flow field plate being less than a pitch of another flow field plate in varying degrees and a thickness of the plate less than 1mm," it was obvious to the Applicants that the term "pitch" need to be expounded as the Examiner didn't understand context of the term as it had been clearly defined by the Applicants in the specification. Hence to make clear to

the Examiner the meaning and context of the term "pitch," the Applicants pointed to paragraph [0005] of the specification in their response. Words of the claim must be given their plain meaning unless applicant has provided a clear definition in the specification. *In re Zletz*, 893 F.2d 319, 321, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989); *Chef America, Inc. v. Lamb-Weston, Inc.*, 358 F.3d 1371, 1372, 69 USPQ2d 1857 (Fed. Cir. 2004). Applicant have consistently pointed to the specification for the definition of the term "pitch," and have not wavered from that definition. Where an explicit definition is provided by the applicant for a term, that definition will control interpretation of the term as it is used in the claim. *Toro Co. v. White Consolidated Industries Inc.*, 199 F.3d 1295, 1301, 53 USPQ2d 1065, 1069 (Fed. Cir. 1999) (meaning of words used in a claim is not construed in a "lexicographic vacuum, but in the context of the specification and drawings"). See also MPEP 2111.01.

As Applicants have previously stated in their arguments filed 12/19/05, although channel shape and design vary between the embodiments disclosed by Carlstrom, the pitch does not vary between plates of each embodiment. To highlight this point, Applicants submitted Exhibit A in that response (herein provided as an Evidence Appendix) which shows FIGS. 5-7 of Carlstrom marked up to indicate that the pitch between the plates 502, 504 (FIG. 5), 602, 604 (FIG. 6), and 702, 704 (FIG. 7) of the illustrated embodiments are the same, and that even in the embodiment of Carlstrom, where only one of the plates 702 and 704 is provided with a ridge 706, 708 (see paragraph [0050]), such an embodiment still has the same pitch between the plates. The Applicants have merely used an arbitrary scale in the Exhibit. The scale could have been in microns, inches, or paper clips, as the scale is irrelevant to the point that Carlstrom teaches and discloses in all his illustrated embodiments that the pitch is the same between the plates.

Nowhere in Carlstrom is it disclosed or suggested that a plate of one embodiment, for example, plate 505 (FIG. 5) can be paired up with the plate of another embodiment, for example, plate 608 (FIG. 6). However, even if one skilled was provided with such a suggested, such an embodiment would still not produce that claimed invention as Carlstrom is silent on the desire to vary the pitch between plates. In fact, none of the

cited art provides such a desire. In view of the cited art, only impressible hindsight would provide such motivation to vary the pitch between plates.

In view of the above comments, as Carlstrom fails to disclose or suggest the noted limitation of Claim 13, withdrawal of the anticipatory rejection to the above noted claims is respectfully requested.

Claim 42

Independent claim 42 recites, *inter alia*, the limitations of "said second channels define a cross sectional width approximately equal to a cross sectional width defined by said first channels, said second flow field plate defines a channel pitch substantially greater than a channel pitch defined by said first flow field plate." Nowhere in Carlstrom is it disclosed or suggested that second channels define a cross sectional width approximately equal to a cross sectional width defined by first channels, and a second flow field plate defines a channel pitch substantially greater than a channel pitch defined by a first flow field plate. The above comments made in reference to claim 13 also apply here to claim 42. The "pitch" of a flow field plate is defined in the specification as "the cross sectional width of the channel plus the cross sectional width of an adjacent land." See paragraph [0005] of the specification in the present invention. As Carlstrom fails to disclose or suggest a device having a channel pitch defined by a second flow field plate substantially greater than a channel pitch defined by a first flow field, withdrawal of the anticipatory rejection to the above noted claims is respectfully requested.

Rejection under 35 U.S.C. §103(a) as being unpatentable over Carlstrom in view of Suzuki (US 2002/0004158).

In the Office Action, claims 23, 25-27, 29, 30, and 32 are rejected as being unpatentable over Carlstrom in view of Suzuki et al. U.S. Pre-Grant Publication No. 2002/0004158, hereafter "Suzuki et al." This rejection is respectively traversed in view of the following comments.

The above noted claims depend from claim 13, which as pointed out above, Carlstrom fails to teach the limitation of "a pitch defined by said first flow field plate is less than a pitch defined by said second flow field plate." As pointed out in the

arguments filed 8/16/05, Suzuki et al. also fail to disclose or suggest that a pitch of a cathode flow field plate is less than the pitch of an anode flow field plate.

Applicants note that the cathode and anode separators (i.e., flow field plates), indicated as symbol 1 in FIG. 6 of Suzuki et al. are all provided with the same pattern, and hence the separators sandwiching the membrane electrode assembly (MEA)(elements 10, 11, and 12 in FIG. 6) will have the same cross-section and pitch. Nowhere in Suzuki et al. is it disclosed or suggested that a pitch of a cathode flow field plate is less than the pitch of an anode flow field plate. Furthermore, nowhere is it disclosed or suggested that the channels between two plates that are separated by a MEA have the same channel cross-section, yet one plate has a channel pitch greater than the other plate. Independent claim 13 recites, *inter alia*, the limitation of "a pitch defined by said first flow field plate is less than a pitch defined by said second flow field plate." Therefore, as the combined teachings of Carlstrom and Suzuki et al. would fail to disclose or suggest the recited invention of independent claim 13, withdrawal of this rejection to dependent claims 23, 25-27, 29, 30, and 32 is respectfully requested.

Conclusion

The Board is requested to reverse the rejections of claims 13-42 in their entirety.

Respectfully submitted,
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CLAIMS APPENDIX

1-12. (Canceled)

13. (Previously Amended) A device comprising an electrochemical cell, said electrochemical cell comprising:

a membrane electrode assembly defining an anode side of said cell and a cathode side of said cell;

a first flow field plate for the cathode side of said cell, said first flow field plate comprising a plurality of first channels separated by first lands; and

a second flow field plate for the anode side of said cell, said second flow field plate comprising a plurality of second channels separated by second lands, wherein

said membrane electrode assembly is interposed between said first and second flow field plates, and

a pitch defined by said first flow field plate is less than a pitch defined by said second flow field plate.

14. (Original) The device according to claim 13 wherein the pitch defined by said second flow field plate is approximately twice as large as the pitch defined by said first flow field plate.

15. (Original) The device according to claim 13 wherein at least one of said second lands has a cross sectional width wider than a cross sectional width of at least one of said first lands.

16. (Original) The device according to claim 13 wherein said first channels define a cross sectional width approximately equal to a cross sectional width defined by said second channels.

17. (Original) The device according to claim 13 wherein a substantial number of said second lands define a cross sectional width greater than a cross sectional width defined by a substantial number of said first lands.

18. (Original) The device according to claim 13 wherein a substantial number of said second channels define a cross sectional width approximately equal to a cross sectional width defined by a substantial number of said first channels.

19. (Original) The device according to claim 13 wherein a majority of said second lands define a cross sectional width greater than a cross sectional width defined by a majority of said first lands.

20. (Original) The device according to claim 13 wherein a majority of said first channels define a cross sectional width approximately equal to a cross sectional width defined by a majority of said second channels.

21. (Original) The device according to claim 13 wherein substantially all of said second lands define a cross sectional width greater than a cross sectional width defined by substantially all of said first lands.

22. (Original) The device according to claim 13 wherein substantially all of said first channels define a cross sectional width approximately equal to a cross sectional width defined by substantially all of said second channels.

23. (Original) The device according to claim 13 wherein said first and second channels each have a cross sectional width of 1.5 mm or less.

24. (Original) The device according to claim 13 wherein each of said flow field plates have a thickness of 1 mm or less.

25. (Original) The device according to claim 13 wherein a cross sectional width of each said first lands is 1mm or less.

26. (Original) The device according to claim 13 wherein a cross sectional width of each said second lands is about 3 times wider than a cross sectional width of each said first lands.

27. (Original) The device according to claim 26 wherein said first channels define a cross sectional width approximately equal to a cross sectional width defined by said second channels.

28. (Original) The device according to claim 13 wherein said first and second channels are predominately straight.

29. (Original) The device according to claim 13 wherein said first and second channels each have a depth of about 1 mm or less.

30. (Original) The device according to claim 13 wherein the pitch defined by said first flow field plate is about 2.5 mm or less.

31. (Original) The device according to claim 13 wherein said device further comprises structure defining a fuel cell of the PEM-type.

32. (Original) The device according to claim 31 wherein said device further comprises structure defining a vehicle powered by said fuel cell.

33. (Original) The device according to claim 13 wherein said second lands are oriented at an angle to said first lands in a plane parallel to said second flow field plate.

34. (Original) The device according to claim 33 wherein said angle is in the range of 0° to 90°.

35. (Original) The device according to claim 13 wherein said first and second fluid flow plates lie in substantially parallel planes and said first channels, said first lands, said

second channels, and said second lands define respective pitches that ensure at least about 30% land-to-land contact across a surface of a membrane interposed between said first and second flow field plates.

36. (Original) The device according to claim 35 wherein said respective pitches ensure at least about 30% land-to-land contact regardless of the manner in which said first lands are aligned relative to said second lands.

37. (Original) The device according to claim 13 wherein at least one of said first and second channels are formed with a multiple of alternating angles.

38. (Original) The device according to claim 13 wherein said first and second lands each have a wiggle alignment pattern, and each said wiggle alignment pattern is in phase respectively.

39. (Original) The device according to claim 13 wherein said first and second lands each have a wiggle alignment pattern and each said wiggle alignment pattern is out of phase respectively.

40. (Previously Amended) The device according to claims 33 wherein said first and second channels are predominately straight.

41. (Original) The device according to claims 13 wherein said first and second channels are serpentine.

42. (Previously Amended) A device comprising an electrochemical cell, said electrochemical cell comprising:

a membrane electrode assembly defining an anode side of said cell and a cathode side of said cell;

a first flow field plate for the cathode side of said cell, said first flow field plate comprising a plurality of first channels separated by first lands; and

a second flow field plate for the anode side of said cell, said second flow field plate comprising a plurality of second channels separated by second lands, wherein

said membrane electrode assembly is interposed between said first and second flow field plates,

said second channels define a cross sectional width approximately equal to a cross sectional width defined by said first channels,

said second flow field plate defines a channel pitch substantially greater than a channel pitch defined by said first flow field plate, and

at least said second lands are formed with a multiple of alternating angles relative to said first lands in a plane parallel to said second flow field plate and said respective channel pitches and cross-sectional widths ensure at least 30% land-to-land contact which is insensitive to plate-to-plate positioning.

EVIDENCE APPENDIX

Exhibit A: FIGS. 5-7 of Carlstrom marked up to indicate that the pitch between the plates 502, 504 (FIG. 5), 602, 604 (FIG. 6), and 702, 704 (FIG. 7) of the illustrated embodiments are the same. Entered in Applicants' response filed 12/19/05.

RELATED PROCEEDINGS APPENDIX

NONE

EXHIBIT A (PAGE 1 OF 2)

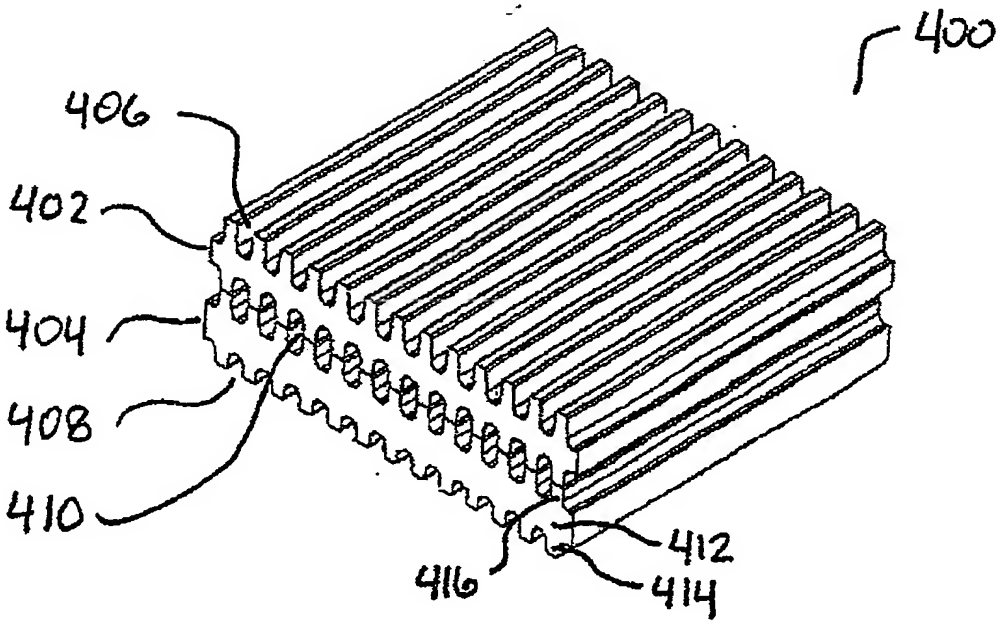

Fig. 4 (Prior Art)

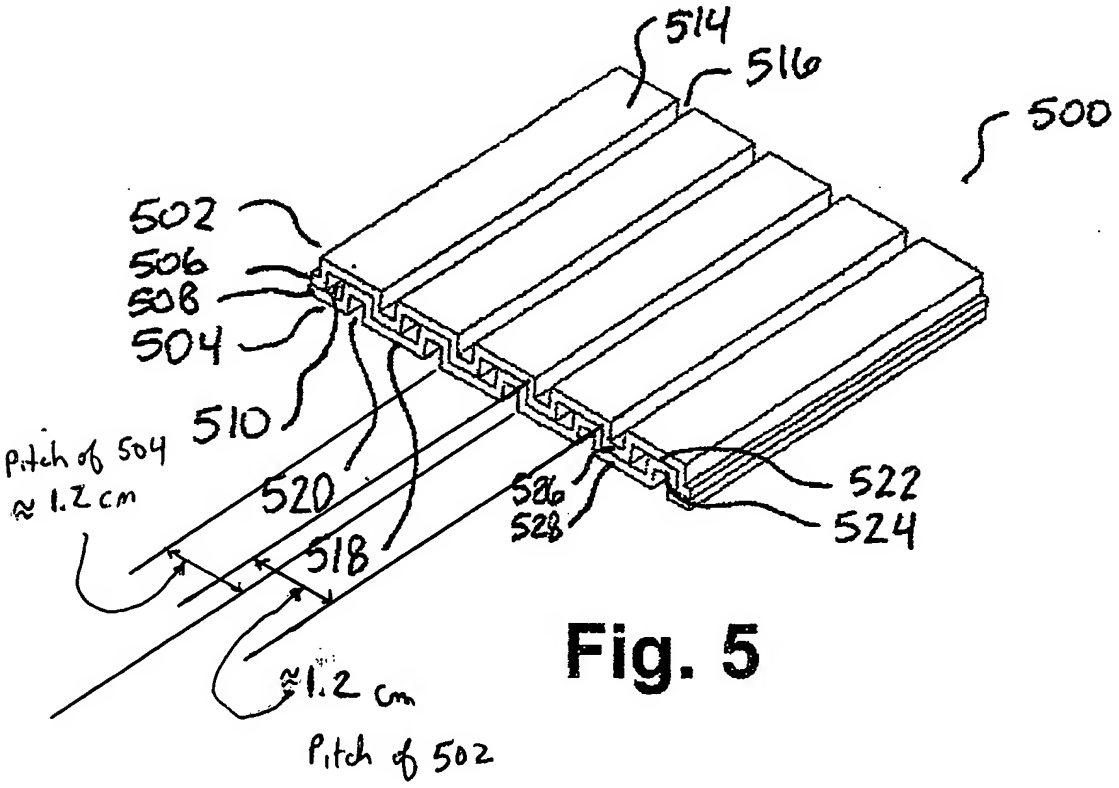

Fig. 5

EXHIBIT A (PAGE 2 OF 2)

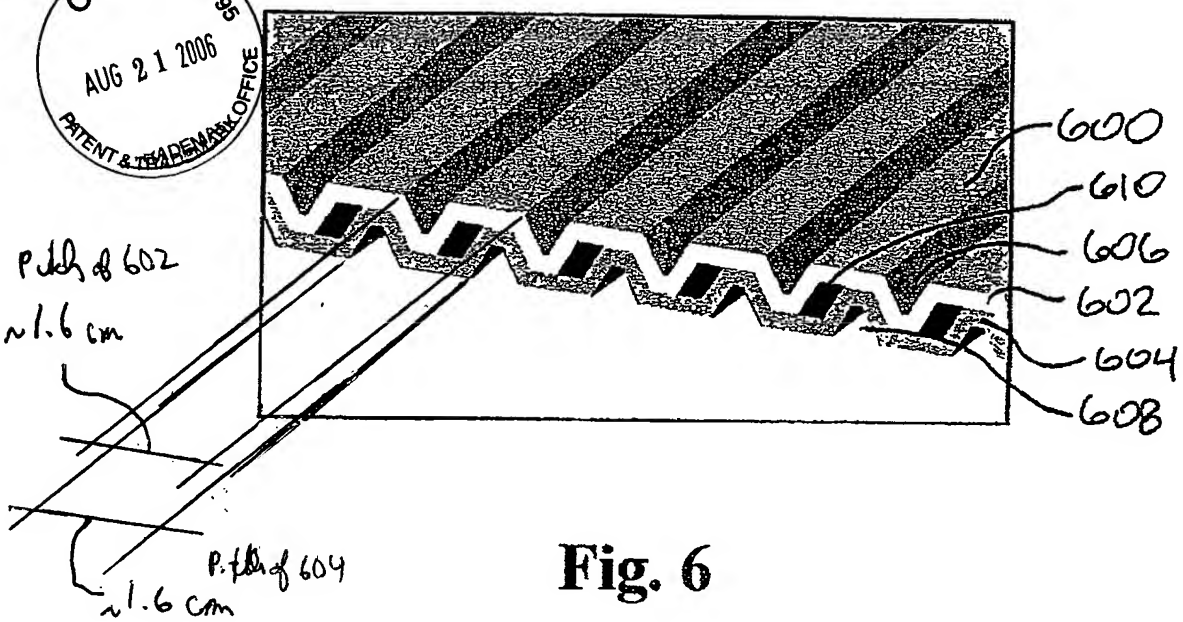

Fig. 6

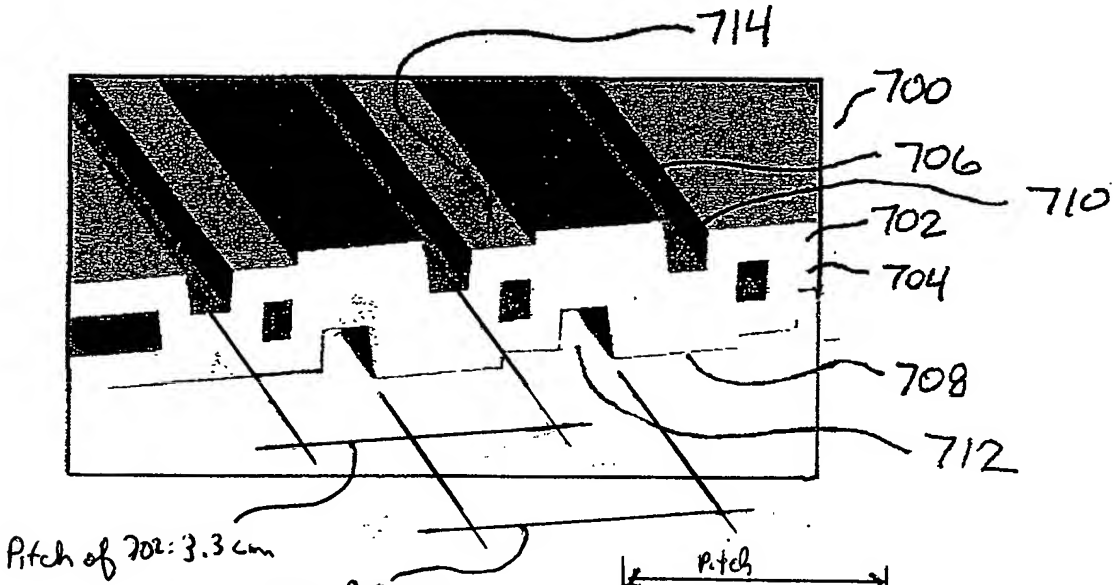

Fig. 7